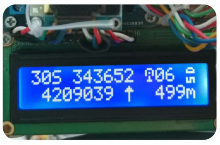
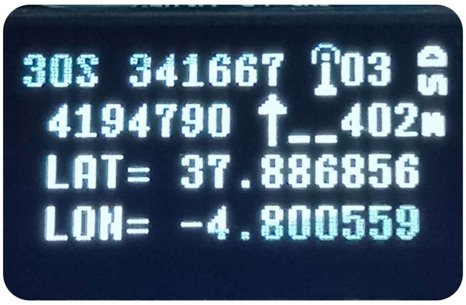
TinyTrackGPS

ARDUINO© TINYTRACKGPS

VERSION V0.8

A simple track GPS to SD card logger.





This program is written in C/C++ for Arduino © UNO R3 and other compatible microcontrollers based on Atmega328 and similar.

It is tested on:

- UNO R3 board (Arduino UNO compatible board based on Atmega328).
- Lgt8f328p (a replacement Arduino Pro Mini).Tested v0.1 and v0.2.

List of componets

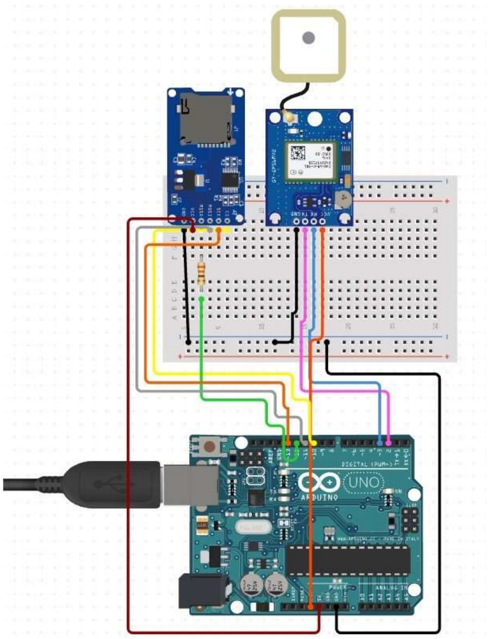
This project use components list above:

- Arduino © UNO board or equivalent AVR.
- NMEA 6 module.
- MicroSD module.
- LCD 16×2 char display module (wired or I2C), or OLED 0.96" I2C (SSD1306) (Optional)
- Bluetooth module. (Optional)

NO DISPLAY

Now you can use a minimal hardware to track GPS location. When no display use MicroSD module and card are mandatory. Comment all lines in 'config.h' file:

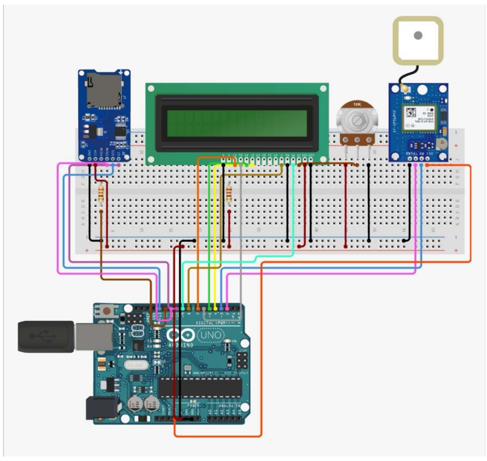
```
//#define DISPLAY_TYPE_SDD1306_128X64     // Para usar pantalla OLED 0.96" I2C 128x
//#define DISPLAY_TYPE_LCD_16X2           // Para usar LCD 16 x 2 carateres.
//#define DISPLAY_TYPE_LCD_16X2_I2C       // Para usar LCD 16 x 2 carateres. I2C.
```



LCD 16x2

If you use LCD 16x2 char wired (6-wires), uncomment line like this in 'config.h' file:

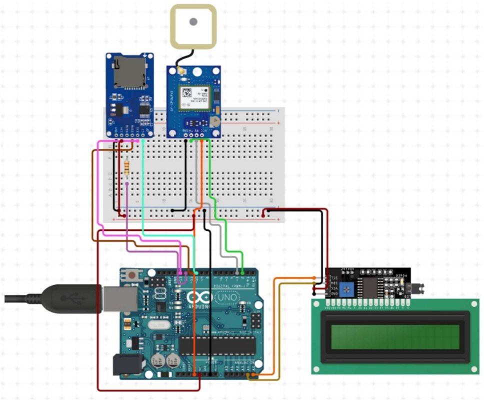
```
#define DISPLAY_TYPE_LCD_16X2
```



LCD 16x2 I2C

If you use LCD 16x2 char I2C (4-wires), uncomment line like this in 'config.h' file:

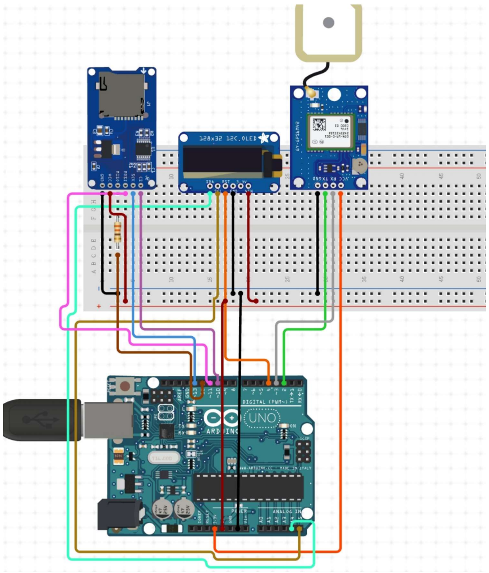
```
#define DISPLAY_TYPE_LCD_16X2_I2C
```



OLED 0'96" 128x64 I2C

If you use OLED 0'96" 128X64 I2C (4-wires), uncomment line like this in 'config.h' file:

```
#define DISPLAY_TYPE_SDD1306_128X64
```



Source

TinyTrackGPS is free software, see **License** section for more information. The code is based and get parts of the libraries above:

- TinyGPS library, Mikal Hart (https://github.com/mikalhart/TinyGPS).
- SdFat library, Bill Greiman (https://github.com/greiman/SdFat).
- U8g2 library, oliver (https://github.com/olikraus/u8g2).
- Low-Power library, Rocket Scream Electronics (https://github.com/rocketscream/Low-Power).
- SoftwareSerial library, Arduino Standard Libraries (Arduino IDE). (only for debug)
- LiquidCrystal library, Arduino Standard Libraries (Arduino IDE).
- LiquidCrystal I2C library, John Rickman (https://github.com/johnrickman/LiquidCrystal_I2C).
- UTMConversion library, Rafael Reyes (https://github.com/RafaelReyesCarmona/UTMConversion).

How to compile

Config

Edit 'config.h' file before, to configure display type commenting the proper line:

```
// Descomentar solo uno de los displays utilizados.
//#define DISPLAY_TYPE_SDD1306_128X64     // Para usar pantalla OLED 0.96" I2C 128x
#define DISPLAY_TYPE_LCD_16X2             // Para usar LCD 16 x 2 carateres.
//#define DISPLAY_TYPE_LCD_16X2_I2C       // Para usar LCD 16 x 2 carateres. I2C.
```

Modify Arduino pin where you connect the LCD 16x2 char:

```
// Definiciones para display LCD 16x2 caracteres.
#define RS 2
#define ENABLE 3
#define D0 4
#define D1 5
#define D2 6
#define D3 7
```

Modify I2C port for LCD 16x2 I2C: (connect in SCL and SDA pins)

```
// Define direccion I2C para LCD16x2 char.
#define I2C 0x27
```

Platformio

Run command `pio.exe run` .

```
Processing Uno (platform: atmelavr; board: uno; framework: arduino)
-------------------------------------------------------------------------------------------------
CONFIGURATION: https://docs.platformio.org/page/boards/atmelavr/uno.html
PLATFORM: Atmel AVR (3.4.0) > Arduino Uno
HARDWARE: ATMEGA328P 16MHz, 2KB RAM, 31.50KB Flash
DEBUG: Current (avr-stub) On-board (avr-stub, simavr)
PACKAGES:
 - framework-arduino-avr 5.1.0
 - toolchain-atmelavr 1.70300.191015 (7.3.0)
LDF: Library Dependency Finder -> http://bit.ly/configure-pio-ldf
LDF Modes: Finder ~ chain, Compatibility ~ soft
Found 12 compatible libraries
Scanning dependencies...
Dependency Graph
|-- <LiquidCrystal> 1.0.7
|-- <TinyGPS> 0.0.0-alpha+sha.db4ef9c97a
|-- <U8g2> 2.28.8
|   |-- <SPI> 1.0
|   |-- <Wire> 1.0
|-- <SdFat> 2.1.0
|   |-- <SPI> 1.0
|-- <LiquidCrystal_I2C> 1.1.4
|   |-- <Wire> 1.0
|-- <Low-Power> 1.81.0
|-- <UTMConversion> 1.0.0
|-- <SoftwareSerial> 1.0
Building in release mode
Checking size .pio\build\Uno\firmware.elf
Advanced Memory Usage is available via "PlatformIO Home > Project Inspect"
RAM:   [=====     ]  50.3% (used 1031 bytes from 2048 bytes)
Flash: [=======   ]  70.7% (used 22798 bytes from 32256 bytes)
================================================= [SUCCESS] Took 2.21 seconds ===================
Environment    Status    Duration
-------------  --------  ------------
Uno            SUCCESS   00:00:02.214
================================================= 1 succeeded in 00:00:02.214 ===================
```

For upload to Arduino use Platformio enviroment or use `platformio.exe run --target upload` command on terminal.

Use of memory (Arduino UNO or equivalent) V0.7

NO DISPLAY

```
RAM:   [=====     ]  50.3% (used 1031 bytes from 2048 bytes)
Flash: [=======   ]  70.7% (used 22798 bytes from 32256 bytes)
```

LCD 16x2 I2C

```
RAM:   [=======   ]  70.2% (used 1437 bytes from 2048 bytes)
Flash: [========= ]  86.0% (used 27748 bytes from 32256 bytes)
```

LCD 16x2 6-WIRED

```
RAM:   [======    ]  59.2% (used 1213 bytes from 2048 bytes)
Flash: [========  ]  81.5% (used 26296 bytes from 32256 bytes)
```

OLED 0'96" 128x64 I2C

```
RAM:   [========  ]  79.7% (used 1632 bytes from 2048 bytes)
Flash: [==========]  96.2% (used 31032 bytes from 32256 bytes)
```

Changelog

V0.8

- Added UTMConversion library for conversion to UTM coordinates. It has been implemented From library UTMconversion.h (TinyTrackGPS V0.7). Now it is an independent library.

V0.7

- Use Low-Power library to reduce power consumption and gain greater autonomy implementing the project portably using lithium batteries.
- No display support for minimal implementation.
- Fixed some errors when displays on LCD 16x2.
- Fixed error when save log on SD. Sometimes data didn't save correctly.

V0.6

- Fixed error GPS log file when compiling for OLED 0'96".
- Added wait animation for OLED 0'96" 128x64.
- Written new procedure to save data in GPS log file.
- Less global variables, so code with less size when compile it.

V0.5

- Added wait animation for LCD 16x2 on "Waitting for GPS signal..." screen.
- Added support for OLED 0'96" 128x64.
- GPS log file set time for create and modify.

- Use SdFat library, Bill Greiman, for better performance.
- Remove switch for select visual data on LCD 16x2. Now data change automatically every 8 seconds between UTM and grades coordenates.

Working

It works getting info from NMEA module every second and save it into de log file.

Log file Format is:

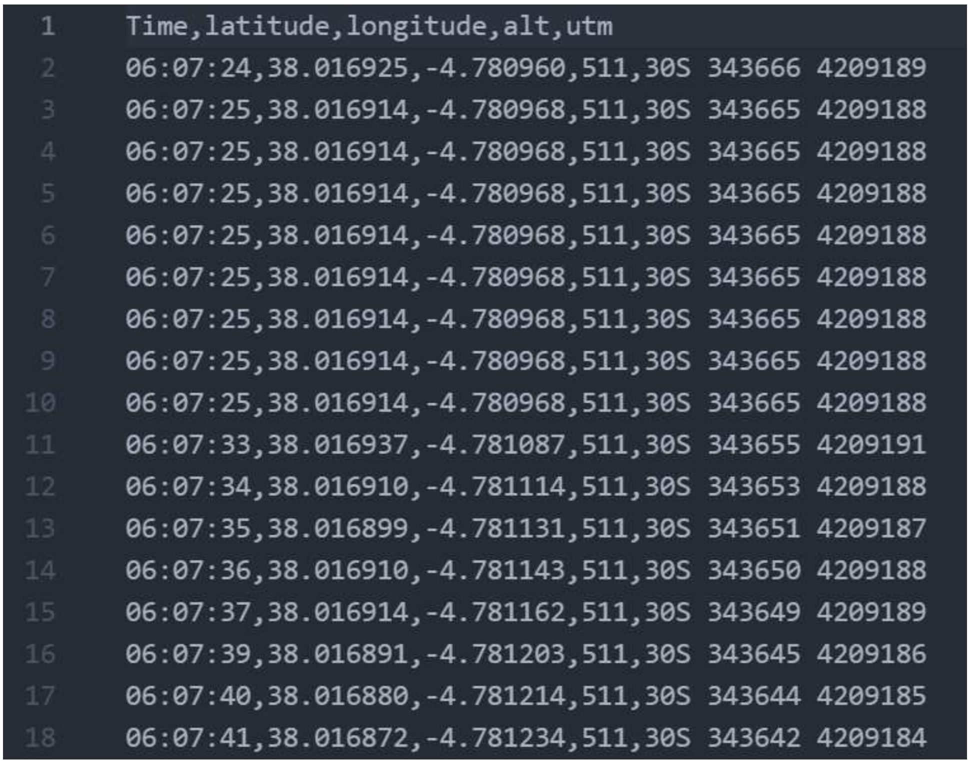
```
HH:MM:SS,YY.YYYYYY,XX.XXXXXX,ALT,UTM
```

Like this:

```
12:42:47,37.990493,-4.785790,571,30S 343186 4206265
12:42:48,37.990276,-4.785741,571,30S 343190 4206240
12:42:49,37.990062,-4.785705,571,30S 343193 4206216
12:42:50,37.989860,-4.785694,571,30S 343193 4206194
...
```

Where:

- HH - Hours from GPS UTC.
- MM - Minutes.
- SS - Seconds.
- YY.YYYYYY - Degree of latitude.
- XX.XXXXXX - Degree of longitude.
- ALT - Altitude in meters.
- UTM - Coordenates in UTM format(WGS84): Zone Band X Y (00A XXXXXX YYYYYYY)



```
Time,latitude,longitude,alt,utm
06:07:24,38.016925,-4.780960,511,30S 343666 4209189
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:25,38.016914,-4.780968,511,30S 343665 4209188
06:07:33,38.016937,-4.781087,511,30S 343655 4209191
06:07:34,38.016910,-4.781114,511,30S 343653 4209188
06:07:35,38.016899,-4.781131,511,30S 343651 4209187
06:07:36,38.016910,-4.781143,511,30S 343650 4209188
06:07:37,38.016914,-4.781162,511,30S 343649 4209189
06:07:39,38.016891,-4.781203,511,30S 343645 4209186
06:07:40,38.016880,-4.781214,511,30S 343644 4209185
06:07:41,38.016872,-4.781234,511,30S 343642 4209184
```

For conversion to UTM coordinates use UTMConversion library. (https://github.com/RafaelReyesCarmona/UTMConversion)

Example of use:

```
#include "UTMconversion.h"

float flat = 37.8959210;
float flon = -4.7478210;

GPS_UTM utm;

void setup() {
  char utmstr[] = "30S 123456 1234567";

  Serial.begin(9600);

  utm.UTM(flat, flon);
  sprintf(utmstr, "%02d%c %ld %ld", utm.zone(), utm.band(), utm.X(), utm.Y());
  Serial.println(utmstr);
}

void loop() {

}
```

File is named as:

`YYYYMMDD.csv` Example: `20210216.csv`

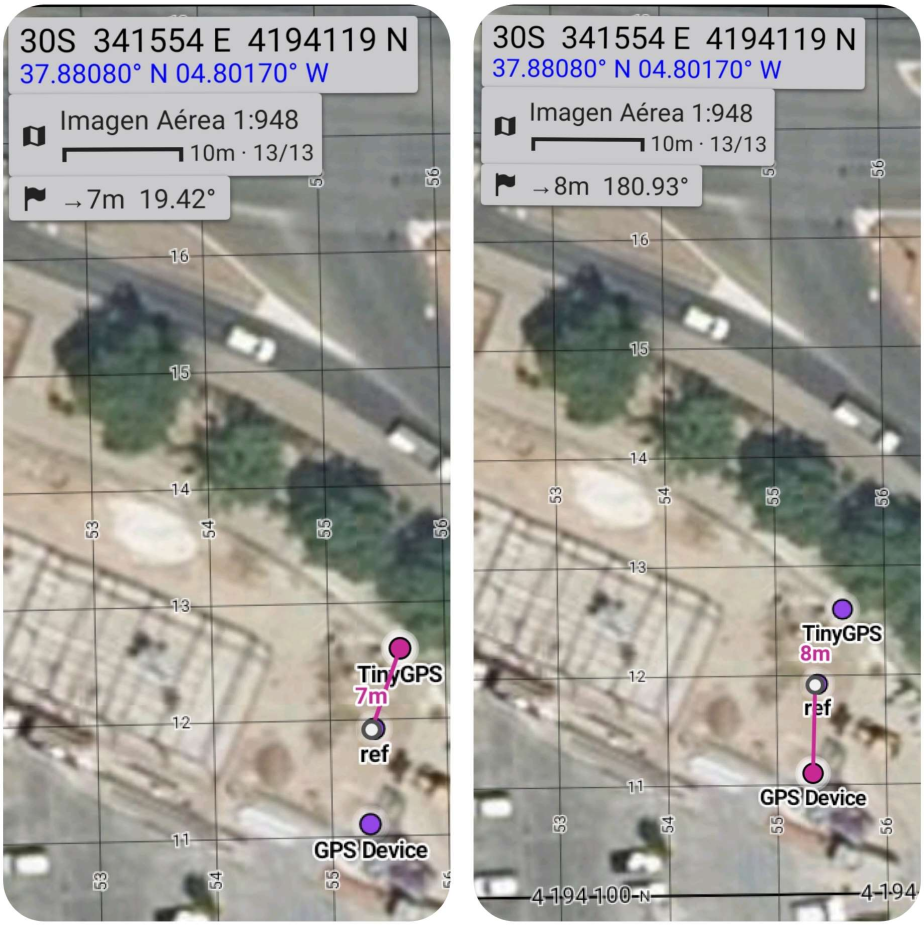
Where:

- YYYY - Year 4 digits format.
- MM - Mouth.
- DD - Day.

`Low-Power` - the library is used to reduce power consumption and gain greater autonomy implementing the project portably using lithium batteries.
Implemented in v0.4 first time and from v0.7.

Accuracy

NMEA 6 GPS module accuracy is similar to others GPS devices. In the picture can see it.



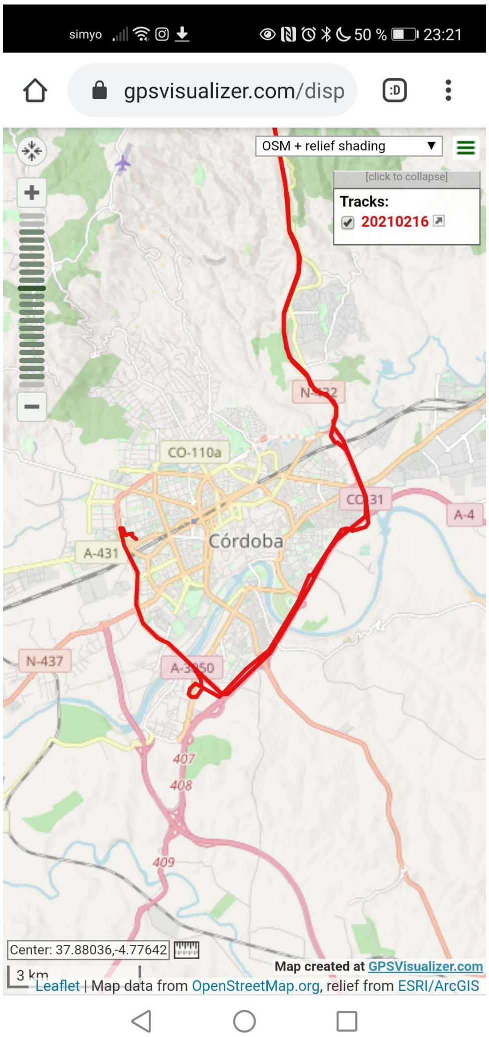
30S 341554 E 4194119 N
37.88080° N 04.80170° W
Imagen Aérea 1:948
10m · 13/13
→7m 19.42°

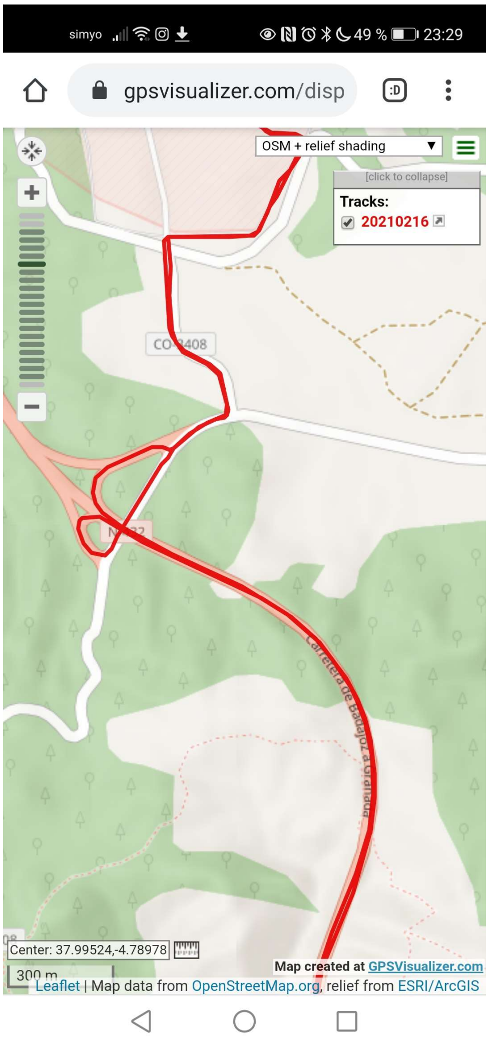
30S 341554 E 4194119 N
37.88080° N 04.80170° W
Imagen Aérea 1:948
10m · 13/13
→8m 180.93°

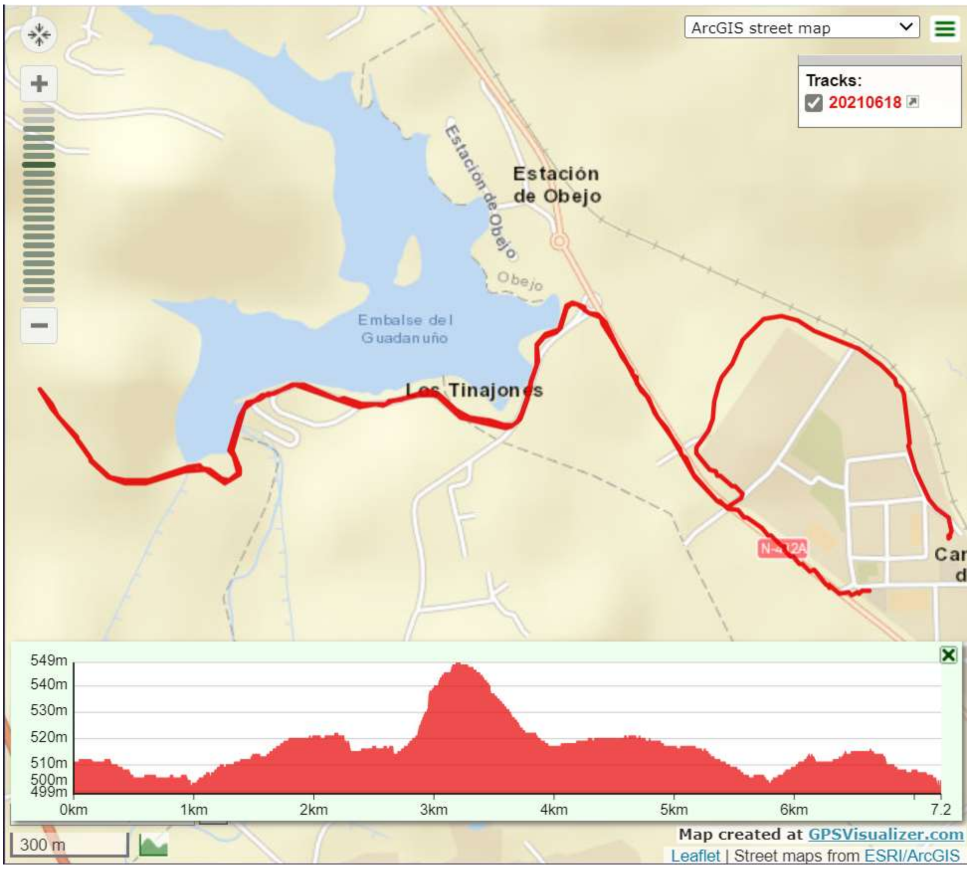
- `Ref` was at *(30S 341554 4194119)* location exactly.
- `TinyGPS` was located at *(30S 341556 4194126)*, 7m error.
- `GPS device` reported *(30S 341553 4194111)*, 8m error.

Draw track on map

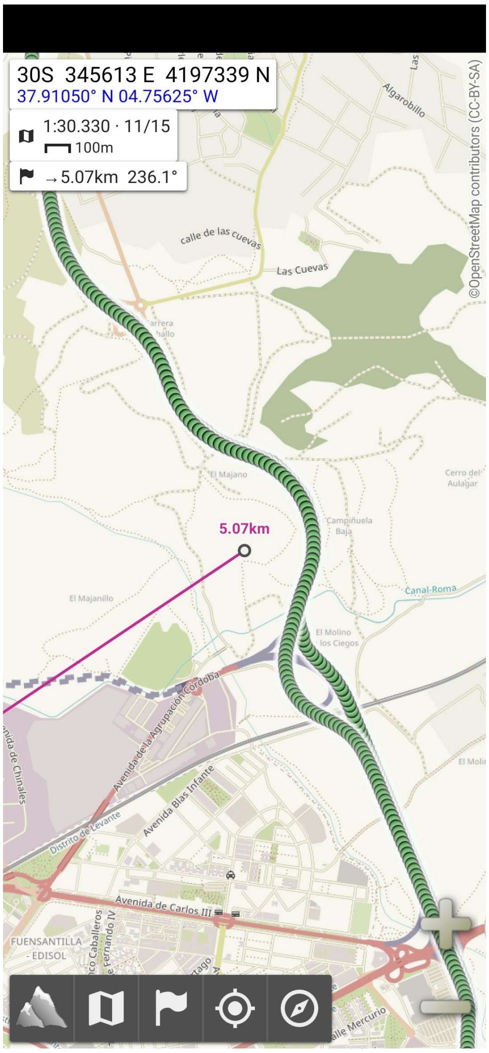
You can upload the file and get the draw on a map using GPS Visualizer.




simyo
49 %
23:29
gpsvisualizer.com/disp
OSM + relief shading
[click to collapse]
Tracks:
20210216
CO-3408
N-432
Carretera de Badajoz a Granada
Center: 37.99524,-4.78978
300 m
Map created at GPSVisualizer.com
Leaflet | Map data from OpenStreetMap.org, relief from ESRI/ArcGIS


ArcGIS street map
Tracks:
20210618
Estación de Obejo
Estación de Obejo
Obejo
Embalse del Guadanuño
Los Tinajones
N-432A
Car
d
549m
540m
530m
520m
510m
500m
499m
0km
1km
2km
3km
4km
5km
6km
7.2
300 m
Map created at GPSVisualizer.com
Leaflet | Street maps from ESRI/ArcGIS

Or using apps like AlpineQuest.



30S 345613 E 4197339 N
37.91050° N 04.75625° W

1:30.330 · 11/15
100m

→5.07km 236.1°

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Credits

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